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10/022,222	12/20/2001	Yoshitarou Yazaki	01-241	4220

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EXAMINER

ALCALA, JOSE H

ART UNIT	PAPER NUMBER
2827	

DATE MAILED: 12/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/022,222

Applicant(s)

YAZAKI ET AL.

Examiner

Jose H Alcala

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 16-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 16-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. This final rejection is in response to amendment filed on 9/16/02.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Reference number 39a and 39b of Figure 1D. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claim 19 is objected to because of the following informalities: line 1 recites: "the metal is tin", where it should read: "the **first** metal is tin". Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-4, 16-19, 22-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the conductor patterns on the sidewall" in line 6. There is insufficient antecedent basis for this limitation in the claim. It is unclear if the recitation is referring to the pair of conductor patterns formed on the insulator board, or to another conductive element or plating in the via-hole.

In addition in lines 6- 8, the recitation: "a shape in such a manner that the farther from the conductor patterns on the sidewall, the closer to the center axis of the via-hole", is unclear. It is not clear what is the exact shape of the sidewall, and what is its relationship with the conductor patterns

It is further unclear in line 12, how can the conductor patterns be "electrically interconnected using solid phase diffusion layers", and be interconnected by "a unified conductive compound" as recited in line 4. Are the solid phase diffusion layers part of the unified conductive compound, or a separate element, and in the second case it is not clear what are the structural relationship between the elements.

In lines 13 and 14, it is not clear what is meant by the recitation: "formed by mutual solid phase diffusion between the same metal as the metal in the conductor patterns and the same metal as the first metal in the conductive compound". For examination purposes, that recitation is interpreted to be a method of making the solid phase diffusion layers, and no patentable weight is given.

Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: how is the "pair of solid phase diffusion layers" located regarding the rest of the elements of the printed wiring board, such as the insulator board, the unified conductive compound and the conductor patterns.

It is further unclear, how can the conductor patterns be "electrically interconnected by the solid phase diffusion layers", and be interconnected by "the unified conductive compound", at the same time. Are the solid phase diffusion layers part of the unified conductive compound, or a separate element, and in the second case it is not clear what are the structural relationship between the elements.

Furthermore, it is not clear what is meant by the recitation: "formed by mutual solid phase diffusion between the same metal as the metal included in the conductor patterns and the same metal as the first metal in the conductive compound". For examination purposes, that recitation is interpreted to be a method of making the solid phase diffusion layers, and no patentable weight is given.

Regarding Claim 22, the recitation: "a shape such that the farther from the conductor patterns on the sidewall, the closer the sidewall is to a center axis of the via-hole to the center axis of the via-hole", is unclear. It is not clear what is the exact shape of the sidewall, and what is its relationship with the conductor patterns.

Claim 23 recites: "the shape of the sidewall of the unified conductive compound follows a protrusion of the insulator board that increases toward the center axis with increasing distance from the conductor patterns along the sidewall". It is unclear how can the conductor patterns be both on the insulator board, and along the sidewall. It is further unclear, what is meant by: "follows a protrusion", is it that the board protrudes inside the conductive compound?

Claim 24 recites: "the sidewall of the unified conductive compound is inclined with respect to the conductor patterns", which is unclear due to the vagueness of the exact location of the conductive pattern. For example, if the conductive patterns are located along the sidewall, it is not clear how can the unified conductive compound be inclined with respect to them, because if they are located one along the other they will be parallel to each other.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4, 16, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takubo et al. (US Patent No. 6,329,610) in view of Takenouchi et al. et al. (US Patent No. 5,744,758). As best understood by the examiner:

Regarding Claim 1, Takubo teaches a printed wiring board (Reference number 10) comprising: an insulator board (Reference number 21) having a via-hole (the via hole filled with Reference number 31); a pair of conductor patterns (Reference numbers 11a and 12a) formed on the insulator board; and a unified conductive compound (reference number 31) provided in the via-hole and electrically interconnecting the pair of conductor patterns, wherein a sidewall of the unified conductive compound in the via-hole has a shape in such a manner that the farther from the conductor patterns on the sidewall, the closer to a center axis of the via-hole (See figure 1); the pair of conductor patterns including a metal (column 15, line 51); and the conductor patterns are electrically interconnected using solid phase diffusion layers that are formed by mutual solid phase diffusion between the same metal as the metal in the conductor patterns and the same metal as the first metal in the conductive compound. Takubo fails to explicitly teach that the unified conductive compound comprises a first metal and a second metal having a higher melting point than a heating temperature required for interconnecting the conductor patterns; and the conductor patterns are electrically interconnected using solid phase diffusion layers that are formed by mutual solid phase diffusion between the same metal as the metal in the conductor patterns and the same metal as the first metal in the conductive compound.

Takenouchi et al. teaches a printed circuit board (reference number 10), having a via hole (reference number 18) having an unified conductive compound (reference number 20) comprising a first metal (column 7, lines 56 and 57) and a second metal (column 6, lines 6-8) having a higher melting point than a heating temperature required

for interconnecting the conductor patterns; and the conductor patterns (reference number 22) are electrically interconnected using solid phase diffusion layers. The limitation that the solid diffusion layers are: "formed by mutual solid phase diffusion between the same metal as the metal in the conductor patterns and the same metal as the first metal in the conductive compound", is a product by process limitation. If the product in the product-by-process claims are the same as or obvious from a product of the prior art, the claims are unpatentable even though the prior product was made by a different process. See *In re Thorpe*, 227 USPQ 964,966 (Fed.Cir 1985). A "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Takubo and Takenouchi in order to incorporate the unified conductive compound taught by Takenouchi reference to the

Takubo structure, thus reducing the cost of the filling process while reducing the generation of gas which would affect the electro-conductivity of the board.

Regarding Claim 2, Takubo teaches that the side wall of the conductive compound has an arch shape on a cross-sectional plane passing through a center axis of the via-hole (See figure 1).

Regarding Claim 3, Takubo teaches that the insulator board thereof is made of thermoplastic resin (column 15, lines 65-66).

Regarding Claim 4, the limitation that: "the conductive compound is made of sintered metal made from metal particles", is a product by process limitation (see explanation in rejection of claim 1).

Regarding Claim 16, Takubo as modified by Takenouchi teaches that the first metal is tin (Takenouchi in column 7, lines 56 and 57) and the second metal is silver (Takenouchi in column 6, lines 6-8).

Regarding Claim 23, Takubo teaches that the shape of the sidewall of the unified conductive compound follows a protrusion of the insulator board that increases toward the center axis with increasing distance from the conductor patterns along the sidewall (See figure 1).

Regarding Claim 24, Takubo teaches that the sidewall of the unified conductive pattern is inclined with respect to the conductor patterns, wherein stress concentrations are avoided at an area of an electrical contact between the conductive patterns and the unified conductive compound (See figure 1).

Regarding Claim 17, Takubo teaches a printed wiring board (reference number 10) comprising: an insulator board (Reference number 21) having a via-hole (the via hole filled with Reference number 31); a pair of conductor patterns (Reference numbers 11a and 12a), which include a metal (column 15, lines 50-51) and are formed on the insulator board; a unified conductive compound (reference number 31) wherein the conductor patterns are electrically interconnected by the unified conductive compound (See figure 1). Takubo fails to explicitly teach that the unified conductive compound includes a first metal and a second metal that has a higher melting point than a heating temperature required for interconnecting the conductor patterns; and a pair of solid phase diffusion layers, which are formed by mutual solid phase diffusion between the same metal as the metal included in the conductor patterns and the same metal as the first metal included in the conductive compound, and that the conductor patterns are electrically interconnected by the the solid phase diffusion layers.

Takenouchi et al. teaches a printed circuit board (reference number 10), having a via hole (reference number 18) having an unified conductive compound (reference number 20) including a first metal (column 7, lines 56 and 57) and a second metal (column 6, lines 6-8) having a higher melting point than a heating temperature required for interconnecting the conductor patterns; and the conductor patterns (reference number 22) are electrically interconnected using solid phase diffusion layers.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Takubo and Takenouchi in order to incorporate the unified conductive compound taught by Takenouchi reference to the

Takubo structure, thus reducing the cost of the filling process while reducing the generation of gas which would affect the electro-conductivity of the board.

Regarding claim 18, Takubo as modified by Takenouchi teaches that the conductive compound is an alloy that includes metal. The limitation that the alloy: "includes sintered metals made from metal particles" is a product by process limitation, (see explanation in rejection of claim 1).

Regarding Claim 19, Takubo as modified by Takenouchi teaches that the first metal is tin (Takenouchi in column 7, lines 56 and 57) and the second metal is silver (Takenouchi in column 6, lines 6-8).

Regarding Claim 20, Takubo teaches a printed wiring board comprising (reference number 10): an insulator board (Reference number 21) having a via-hole (the via hole filled with Reference number 31); a pair of conductor patterns (Reference numbers 11a and 12a), which include a metal (column 15, lines 50-51) and are formed on the insulator board; a unified conductive compound (reference number 31) which is an alloy, wherein the conductor patterns are electrically interconnected by the unified conductive compound (See figure 1). Takubo fails to explicitly teach that the unified conductive compound includes a first metal and a second metal that has a higher melting point than a heating temperature required for interconnecting the conductor patterns and that the conductive compound is an alloy that includes sintered metals made from metal particles including the first metal and other metal particles including the second metal.

Takenouchi et al. teaches a printed circuit board (reference number 10), having a via hole (reference number 18) having an unified conductive compound (reference number 20) including a first metal (column 7, lines 56 and 57) and a second metal (column 6, lines 6-8) having a higher melting point than a heating temperature required for interconnecting the conductor patterns; and the conductor patterns (reference number 22) are electrically interconnected using solid phase diffusion layers. The limitation that the alloy: "includes sintered metals made from metal particles including the first metal and other metal particles including the second metal" is a product by process limitation, (see explanation in rejection of claim 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Takubo and Takenouchi in order to incorporate the unified conductive compound taught by Takenouchi reference to the Takubo structure, thus reducing the cost of the filling process while reducing the generation of gas which would affect the electro-conductivity of the board.

Regarding Claim 21, Takubo as modified by Takenouchi teaches that the first metal is tin (Takenouchi in column 7, lines 56 and 57) and the second metal is silver (Takenouchi in column 6, lines 6-8).

Regarding Claim 22, Takubo teaches that in a sidewall of the unified conductive compound in the via-hole has a shape such that the farther from the conductor patterns on the sidewall, the closer the sidewall is to a center axis of the via-hole (See Figure 1)

Response to Arguments

8. Applicant's arguments with respect to claims 1-5 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references have some of the elements of the instant claimed invention: Shimada et al. (US Patent No. 6,087,597) and Ito et al. (US Patent No. 5,473,120).
10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Application/Control Number: 10/022,222
Art Unit: 2827

Page 13

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jose H Alcala whose telephone number is (703) 305-9844. The examiner can normally be reached on Monday to Friday.
12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3431 for After Final communications.
13. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JHA
December 10, 2002


ALBERT W. PALADINI
PRIMARY EXAMINER